

Remarks

In view of the above amendments and the following remarks, reconsideration and further examination are requested.

The specification and abstract have been reviewed and revised to make a number of editorial revisions. No new matter has been added.

Claims 1-15 have been rejected under 35 U.S.C. § 102(b) as being anticipated by Hiyama (EP 0754525). Claims 1-3, 5-9, 11 and 13-15 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Varian (US 5,916,010). Claims 4, 10 and 12 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Varian in view of Gonzalez-Martin (US 6,390,897).

Claims 1-15 have been cancelled without prejudice or disclaimer to the subject matter contained therein. New claims 16-27 have been added. Support for new claims 16-27 can be found at least at paragraphs [0034] and [0038] of the specification.

It is submitted that the above-mentioned rejections are inapplicable to the new claims for the following reasons.

Claim 16 is patentable over Hiyama and Varian, since claim 16 recites a method of polishing a workpiece including, in part, dressing a polishing surface after polishing by ejecting fluid jets from a radially inward position at a first speed or pressure and from a radially outward position at a second speed or pressure which is higher than the first speed or pressure. Hiyama and Varian both fail to disclose or suggest this feature as recited in claim 16.

Hiyama discloses a polishing apparatus comprising a turntable 1 having polishing cloth 4 attached thereto, a top ring 3 positioned above the turntable 1 for holding a semiconductor wafer 2 against the turntable 1, and an abrasive liquid supply nozzle 5 disposed above the turntable 1 for supplying an abrasive liquid onto the polishing cloth 4 attached to the turntable 1. The polishing apparatus also comprises a dressing head 8 having a dressing element 9 located thereon for dressing the polishing cloth 4, and a dressing liquid supply nozzle 10 extending over the turntable 1 for supplying a dressing liquid, such as water, to the polishing cloth 4 at a predetermined position thereon. (See column 3, line 58 - column 4, line 53 and Figures 1 and 2).

In Hiyama, after the polishing cloth 4 is used to polish the semiconductor wafer 2, the polishing cloth 4 is dressed to restore its polishing properties. The polishing cloth 4 is dressed by

rotating the dressing head 8 and the dressing element 9 and pressing the dressing element 9 against the polishing cloth 4 to a predetermined pressure. At the same time or prior to the dressing element 9 contacting the polishing cloth 4, the dressing liquid is supplied from the dressing liquid supply nozzle 10 to the upper surface of the polishing cloth 4. (See column 5, lines 20-37).

Based on the above discussion, it is apparent that Hiyama only discloses the single dressing liquid supply nozzle 10 for supplying the dressing liquid to the polishing cloth 4 at a predetermined position thereon. Therefore, Hiyama necessarily fails to disclose or suggest dressing the polishing surface after polishing by ejecting fluid jets from a radially inward position at a first speed or pressure and from a radially outward position at a second speed or pressure which is higher than the first speed or pressure. Hiyama fails to disclose or suggest ejecting the dressing liquid as a plurality of fluid jets at different speeds or pressures based on radial position. As a result, claim 16 is patentable over Hiyama.

Varian discloses a polishing pad maintenance apparatus having a forced fluid spray assembly 12 which is radially oriented over a pad 22 to which the maintenance is being performed. The forced fluid spray assembly 12 has an array of nozzles 24 uniformly extending along the forced fluid spray assembly 12 at an angle such that the fluid sprays away from a conditioning plate 18 and towards an outer edge of the pad 22. The forced fluid spray assembly 12 also has an attachment 32 for connecting to a fluid source for supplying the fluid to the array of nozzles 24 and multiple attachments 26 for connecting the forced fluid spray assembly 12 to a conditioning housing assembly 14. The forced fluid spray assembly 12 is used to clear the pad 22 of all loose particles and debris before the pad 22 is conditioned. Therefore, the particles are not imbedded into the pad 22 by the conditioning plate 18. (See column 5, line 23 - column 6, line 13 and Figures 1 and 3).

Based on the above discussion, it is apparent that while the array of nozzles 24 of the forced fluid spray assembly 12 are uniformly angled, Varian fails to disclose or suggest that the fluid ejected from the nozzles 24 is ejected from a radially inward position at a first speed or pressure and from a radially outward position at a second speed or pressure which is higher than the first speed or pressure, as is recited in claim 16. Instead, it appears that the fluid ejected from the nozzles 24 is ejected at a constant speed or pressure along the whole radius of the pad 22. As a result, claim 16 is patentable over Varian.

As for claim 20, it is patentable over Hiyama and Varian, since claim 20 recites a method of polishing a workpiece including, in part, dressing a polishing surface after polishing by ejecting fluid jets from a plurality of jet nozzles positioned at different heights from the polishing surface. Hiyama and Varian both fail to disclose or suggest this feature of claim 20.

As discussed above, Hiyama only discloses the single liquid supply nozzle 10 for supplying the dressing liquid to the polishing cloth 4 at a predetermined position thereon. (See column 4, lines 47-53 and Figure 1). Therefore, Hiyama necessarily fails to disclose or suggest dressing the polishing surface by ejecting fluid jets from a plurality of jet nozzles positioned at different heights from the polishing surface. As a result, claim 20 is patentable over Varian.

As for Varian, it does illustrate the plurality of nozzles 24 extending along the spray assembly 12 that spray fluid on the pad 22 before it is conditioned. (See column 5, line 50 - column 6, line 13 and Figure 3). However, it is apparent from Figure 3 that the nozzles 24 are all positioned at a constant height over the pad 22. As a result, claim 20 is also patentable over Varian.

Claim 24 is patentable over Hiyama and Varian, since claim 24 recites a method of polishing a workpiece including, in part, dressing a polishing surface after polishing by ejecting fluid jets from a plurality of jet nozzles, wherein a number of the plurality of jet nozzles at a radially inward position is less than a number of the plurality of jet nozzles at a radially outward position. Hiyama and Varian also fail to disclose or suggest this feature of claim 24.

As discussed above, Hiyama discloses the single dressing liquid supply nozzle 10 for supplying the dressing liquid, such as water, to the polishing cloth 4 at a predetermined position thereon. (See column 4, lines 47-53 and Figure 1). Therefore, Hiyama necessarily fails to disclose or suggest dressing the polishing surface after polishing by ejecting fluid jets from a plurality of jet nozzles, wherein a number of the plurality of jet nozzles at a radially inward position is less than a number of the plurality jet nozzles at a radially outward position. As a result, claim 24 is patent over Hiyama.

Varian does disclose the plurality of nozzles 24 extending along the spray assembly 12 for supplying fluid to the pad 22. (See column 5, line 50 - column 6, line 13 and Figure 3). However, it is apparent from Figure 3 that the nozzles 24 are positioned in single file along the length of the spray assembly 12. Therefore, Varian also fails to disclose or suggest dressing the polishing surface after polishing by ejecting fluid jets from a plurality of jet nozzles, wherein a number of the plurality

of jet nozzles at a radially inward position is less than a number of the plurality of jet nozzles at a radially outward position. As a result, claim 24 is also patentable over Varian.

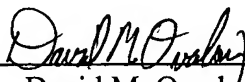
As for Gonzalez-Martin, it is relied upon as disclosing a CMP apparatus which uses fluid jets to clean a semiconductor wafer. However, Gonzalez-Martin fails to disclose or suggest the above-discussed features of claims 16, 20 and 24.

Because of the above-mentioned distinctions, it is believed clear that claims 16-27 are patentable over the references relied upon in the rejections. Furthermore, it is submitted that the distinctions are such that a person having ordinary skill in the art at the time of invention would not have been motivated to make any combination of the references of record in such a manner as to result in, or otherwise render obvious, the present invention as recited in claims 16-27. Therefore, it is submitted that claims 16-27 are clearly allowable over the prior art of record.

In view of the above amendments and remarks, it is submitted that the present application is now in condition for allowance. The Examiner is invited to contact the undersigned by telephone if it is felt that there are issues remaining which must be resolved before allowance of the application.

Respectfully submitted,

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